BOTANICAL ANALYSIS
NATIONAL FORESTS IN NORTH CAROLINA
APPALACHIAN RANGER DISTRICT
NORTHSIDE TIMBER SALE

I. INTRODUCTION

This report documents the findings of a Botanical Analysis (BOTA) of a proposed timber sale and associated road improvements to existing roads within the North Side project area. The proposed activities and possible extent of those activities are listed below. The potential effects of this proposal on Endangered or Threatened (T. & E.), Regional Forester's Sensitive (S.) and Forest Concern (FC.) plant species are evaluated. The effect of this proposal to natural communities and exotic plant species are also discussed. Potential direct and indirect effects to T. & E., S. and FC. plant species were analyzed in the areas where timber harvest, road reconstruction and habitat improvement are proposed. These areas are referred to as "activity areas". The possible activity areas are shown on the attached alternative maps. The project area is located in compartments 53 and 55 of the Appalachian Ranger District, Pisgah National Forest, Yancey Co. North Carolina.

Each timber harvest unit is reviewed separately. The proposed project alternatives can be evaluated by the compilation of the appropriate units or activity in each alternative. Table 3 summarizes the alternatives with respect to botanical resources. All areas where an activity is proposed were botanically reviewed. Listed below is are the proposed activities:

1. Timber harvest or timber improvement activities.
This includes: Commercial harvesting using tractor by, two-aged, method, thinning, Site preparation, oak planting and/or herbicide application. Approximately 67 acres were surveyed and reviewed to cover all the possible alternatives to this proposal. It is expected that only a portion of those acres will be included in the chosen alternative.

2. Road reconstruction of existing roads.
This may include: Prehaul maintenance such as grading, and graveling.

3. Prescribed Burning

II. METHODS.

Potentially affected T. & E., S. and FC. plant species were identified after:

(1) reviewing the list of T.&E., S. and FC. plant species of the Pisgah & Nantahala National Forests and their habitat preferences;

(2) consulting element occurrence records of T.&E., S. and FC. plants as maintained by the North Carolina Natural Heritage Programs;

(3) consulting with individuals both in the public and private sector who are knowledgeable of the area and its flora

(4) conducting field surveys in areas designated for ground disturbing activities. All proposed activity areas that contain Rich Cove Forest were surveyed twice during different months. The field surveys were conducted by a meander search pattern to survey all the variation in habitat within the unit. The survey was conducted until all of the habitats within the unit were surveyed and no new plant species were added to the unit species list after a minimum of 20 minute's search was made (timed meander search). Focused attention was given during the surveys to habitats within the units that may be associated with plant T.&E., S. and FC. species, i.e., rock outcrops, seeps, etc. The intensity of the coverage varied depending on the extent of any likely T.&E., S. and FC. species habitat, complexity of vegetation, and/or presence of indicator species. Some areas were virtually devoid of herbaceous vegetation and required very little intensive survey while other areas required considerably more time to adequately survey. Although the search was focused on the possibility of occurrences of the T.&E., S. and FC. plants listed on Table 1, all T.&E., S. and FC. plant species were searched for during the survey. Table 2 summarizes the habitats and/or community(s) in the unit and the occurrence of plant T.&E., S. and FC. species.

III. CURRENT BOTANICAL CONDITION

A. PLANT T.&E., S. and FC. SPECIES

Of the total of 76 plant T.&E., S. and FC. species known to occur in Yancey Co. NC (Appendix B.), all but 18 species were dropped from the list for further consideration and discussion for one of the following reasons: 1) lack of suitable habitat for the species in the project area, 2) the species has a well-known distribution that does not include the project area or 3) based on field surveys of potential habitat, no habitat was seen in the activity areas. Habitats, community types and ranges of plant T.& E., S. and FC. species are derived from information in Classification of the Natural plant Communities of North Carolina, the Natural Heritage Program's List of Rare Plant of North Carolina or information obtained through other botanist. Based upon habitat information, 18 plant T.& E., S. and FC. species could occur in the project or activity area but only three are known to occur and one is likely to occur within the project area and one plant Sensitive species (*Juglans cinerea*) is known to occur within a potential activity area.. Field or literature surveys reveal that *Aconitum reclinatum* (S.) and *Carex woodii* (FC.) are known to occur in the project area but not the potential activity areas. *Carex projecta* (FC.) is likely to[1]

occur in the project area but is not known to occur in the proposed activity area. A list of T.&E., S. and FC. plants known to occur or potentially could occur[2] in the botanical analysis area

[1] The use of "likely to occur" refers to those species that are not documented as occurring in the specified area(s) but are expected to occur there because of documentation of very similar habitat to known populations. For all intents of this document, it should taken that the species does occur in the specified area until fuller documentation of presence/ absence is known.

(compartments 53-58) or activity areas is listed in Table 1.

The proposed units and roads were surveyed by David M. Danley, Forest Botanist on April 22, 28 May 6 1998. All proposed units were visited at least once during these times.

A summary of the field surveys is provided in Table 2. This table lists the habitats, natural communities and plant T.&E., S. and FC. species found in each unit and the associated road reconstruction. One hundred ninety nine common plant species where noted during the field surveys.(Appendix A.)

TABLE 1. Known & Potential T.&E., S. and FC. plant species in the proposed Northside project

SPECIES	TYPE	NATURAL COMMUNITY OR HABITAT	OCCURRENCE
Federally Threatened or Endangered plant species (T &E) (06/01)			
None known	N/A	N/A	N/A
2001 Region 8 Regional Forester's Sensitive plant species (S) (01/2002)			
Aconitum reclinatum	Vascular Plant	Rich Cove Forest and Northern Hardwood Forest	Occurs in botanical analysis area but not activity area
Juglans cinerea	Vascular Plant	Rich Coves	Occurs in unit 3
Carex roanensis	Vascular Plant	Rich Cove and Slope Forests	Could occur in analysis area, not known to occur in analysis or activity area.
Helianthus glaucophyllus	Vascular Plant	Rich Cove and Slope Forests	Could occur in analysis area, not known to occur in analysis or activity area.
Coreopsis latifolia	Vascular Plant	Rich Cove and Slope Forests	Could occur in analysis area, not known to occur in analysis or activity area.
Plagiochila caduciloba	Liverwort	Acidic Cove Forest	Could occur in analysis area, not known to occur in analysis or activity area.
Silene ovata	Vascular Plant	Montane Oak-Hickory Slope Forest.	Could occur in analysis area, not known to occur in analysis or activity area.

2001 Region 8 Regional Forester's Sensitive plant species (S) (01/2002) cont'd

Tsuga caroliniana	Vascular Plant	Pine- Oak Heath	Could occur in analysis area, not known to occur in analysis or activity area.
Forest Concern (FC) Plant Species (01/2002)			
Botrichium oneidense	Vascular Plant	Rich Cove Forest.	Could occur in analysis area, not known to occur in analysis or activity area.
Campanula aparinoides	Vascular Plant	Rocky Shore and Bar, Southern Appalachian Bog	Could occur in analysis area, not known to occur in analysis or activity area.
Carex projecta	Vascular Plant	Bogs, Swamp Forest Bog Complex	Likely to occur in project area but not activity areas.
Carex manhartii	Vascular Plant	Rich Cove and Slope Forests	Could occur in analysis area, not known to occur in analysis or activity area.
Carex woodii	Vascular Plant	Rich Cove and Slope Forests, Montane Oak Forests	Known to occur in the botanical analysis area, not known to occur in the activity area.
Caltha palustris	Vascular Plant	Bogs, Swamp Forest Bog Complex	Could occur in analysis area, not known to occur in analysis or activity area.
Hydrophyllum macrophyllum	Vascular Plant	Northern Hardwood, Rich Cove Forest	Could occur in analysis area, not known to occur in analysis or activity area.
Meehania cordata	Vascular Plant	Rich Cove and Slope Forests	Could occur in botanical analysis area, not known to occur in botanical analysis or activity area.
Trillum rugellii	Vascular Plant	Rich Cove and Slope Forests	Could occur in analysis area, not known to occur in analysis or activity area.
Scutellaria saxitalis	Vascular Plant	Rich Cove and Slope Forests	Could occur in analysis area, not known to occur in analysis or activity area.

[1] In this document, the use of the phases "could occur" or "may occur" are taken to mean probable species occurrence in the very broadest of senses. Only very general habitat preferences and species distribution are used to determine if a species may or could occur. This does not imply their existence in an area.

TABLE 2. Natural Communities and plant T.&E., S. and FC. species by stand.

Compartment /Stand(s)	Proposed Harvest activity(s)	NATURAL COMMUNITIES OR HABITAT	OCCURRENCE of PLANT T.&E., S. and FC. SPECIES
Unit 1	Site Preparation Only	Acidic Cove Forest with Chestnut Oak Forests near top of unit.	No plant T.&E., S. and FC. SPECIES known.
Unit 2	2-Aged Harvest	Acidic Cove Forest with Chestnut Oak Forests near top of unit.	No plant T.&E., S. and FC. SPECIES known.
Unit 3	2-Aged Harvest	Acidic Cove Forest below grading Montane Oak-Hickory Forest near the top. Some element of Rich Cove and Chestnut Oak Forest Seeps at bottom of cove	*Juglans cinerea* (S.) is known to occur . All action alternatives exclude *Juglans cinerea* from direct impacts may have beneficial indirect effects. No other plant T.&E., S. and FC. species known to occur.
Unit 4	Thinning	Mostly Chestnut Oak Forests, Montane Oak-Hickory Forest near the top.	No plant T.&E., S. and FC. SPECIES known.
Unit 5	2-Aged Harvest	Mostly Montane Oak-Hickory grading into Rich Cove Forest at the bottom. Stream/seep in cove. "Boulderfield forest" develops on north slope of this unit see **note** under Rich Cove Forest description,	No plant T.&E., S. and FC. SPECIES known.

B. NATURAL COMMUNITIES, Northside Project Area:

The Northside activity area is contained within the upper Little Spivey Creek drainage. Most of the ridges and valleys have a northwest to southeast trend. The highest points of the project area are about 4700 ft. (Flat Mountain to High Rocks Mountain) which are located between the activity areas. The general elevation of the project area descends to the northwest to Little Spivey Creek (3200 ft.). The topography is typically sloped with some conspicuous flat areas along Little Spivey Creek. There are occasional flatter areas along ridges and in some coves. It is only in these relatively flat cove areas where a few small Swamp Forest Bog Complex communities, and *Carex projecta*, are found. Three main natural communities dominate most of the area within this project area. These communities are: Chestnut Oak Forest, Montane Oak-Hickory Forest and Acidic Cove Forest (See Schafale and Weakley for a detailed description and discussion of these communities). These three communities often grade into each other so that a continuum exists between these typic communities. Rich Cove Forest and Swamp Forest Bog Complex occur in the project area as smaller "inclusions" within three main community types. It is these inclusion communities that often have plant T.&E., S. and FC. species or have

the greatest potential for plant T.&E., S. and FC. to occur. Notice that 12 of the 16 S. or FC. species on Table 1 are found within the Rich Cove Forest Community. The two T.&E., S. and FC. plant species that are known to occur within this project area occur in the Rich Cove Forest or Swamp Forest Bog Complex Communities. Some of the proposed activities are within the Rich Cove Forest Community. Thus, a potential exits for directly affecting plant T.&E., S. and FC. species that utilize Rich Cove Forest Communities. However, all proposed activity areas that contain Rich Cove Forest were surveyed twice during different months. Thus it unlikely that plant T.&E., S. and FC. species are present in the proposed activity areas. This proposal (all alternatives) will affect the following communities:

Acidic Cove and Slope Forest.
Synonymy: Acidic Cove Forest, Hemlock Forest (Schafale & Weakley), Alluvial Forest (Newell).

Dominate Species & Physiognomy: This forest community is dominated by cove hardwood species such as oaks (*Quercus montana*), tulip popular (*Liriodendron tulipifera*), black birch (*Betula lenta*), white pine (*Pinus strobus*) and eastern hemlock (*Tsuga canadensis*). The distinguishing feature of this community is the dominance of evergreen Ericaous shrubs such as *(Rhododendron maximum*) and doghobble (*Leucothoe fontaniana*) or mountain laurel (*Kalmia latifolia*) in the midlayer. The herbaceous layer is usually very poorly developed with sparse and nondiverse species. Generally, the low herbaceous diversity in this community makes this community have a relatively low probability and occurrence of plant T.&E., S. and FC. species. The Acidic Cove and Slope Forest community is very common throughout the Forest. It typically occurs at low to mid elevations in coves and lower slopes.

The Acidic Cove and Slope Forest community is found throughout the analysis area usually associated acidic soils. It is particularly common near in areas near streams. The Acidic Cove and Slope Forest community has a general low potential for T.&E., S. and FC. and Forest Concern species in the analysis area. No T.&E., S. and FC. plants were found in this community. In Yancey county there are no T.&E., S. or Forest Concern plant species listed as in the Acidic Cove and Slope Forest community.

Possible activity areas with Acidic Cove and Slope Communities: Unit 1, 3.

Possible associated T.&E., S. and FC. species in Yancey Co.: None Known.

Chestnut-Scarlet Oak Forest
Synonymy: Chestnut Oak Forest (Schafale & Weakley), Montane Oak Slope Forest (Newell).

Dominate Species & Physiognomy: The Chestnut-Scarlet Oak Forest Community usually occurs on convex slopes surrounding cove forests. Chestnut oak (*Quercus montana*) and scarlet oak (*Quercus coccinea*) with some black oak (*Quercus velutina*) dominate the tree canopy. Generally a dense shrub layer of mountain laurel *(Kalmia latifolia*), huckleberry (*Gaylussacia*

baccata) or blueberry (*Vaccinium sp.*) is found. Herbaceous species are generally few and sparsely distributed. This community type is very common throughout the Forest. Generally the low herbaceous diversity in this community makes this community have a relatively low probability and occurrence of plant T.&E., S. and FC. species. The Chestnut-Scarlet Oak Forest Community often grades into Montane Oak-Hickory and Acidic Cove and Slope Forest.

The Chestnut-Scarlet Oak Forest Community is found throughout the analysis area usually associated acidic soils and dryer slopes and ridges. The Chestnut-Scarlet Oak Forest Community has a general low potential for T.&E., S. and FC. species in the analysis area. No T.&E., S. and FC. plants were found in this community. This proposal would cause the Chestnut-Scarlet Oak Forest Community impacted by this to be in a earlier successional stage.

Possible activity areas with Chestnut-scarlet Oak Forest Communities: Unit 1, 2, & 4.

Possible associated T.&E., S. and FC. species in Yancey Co.: *Thermopsis fraxinifolia* (FC.).

Montane Oak-hickory Slope Forest
Synonymy: Montane Oak-Hickory Forest (Schafale & Weakley), Rich Cove and Slope Forest(Newell).

Dominate Species & Physiognomy: Montane Oak-hickory slope Forest Community can occur most often at mid-slope and upper cove areas. Occasionally, a Montane Oak-hickory slope Forest Community can occur near ridge tops. This community is characterized by the presence of various oak species, the presence of hickories *(Carya spp*.), a lack of Ericaous shrubs, and a rich and diverse herbaceous layer. The associated tree species typically are red oak (*Quercus rubra)* and chestnut oak (*Quercus montana*) predominating with varying amounts of pignut hickory (*Carya glabra*), mockernut hickory (*Carya alba*), white pine (*Pinus strobus*), back gum (*Nyssa sylvatica*), tulip popular (*Liriodendron tulipifera*) and red maple *(Acer rubrum*). This community has the most open and diverse herbaceous layer of the oak dominated communities seen within the analysis area. Typically New York fern (*Thelypteris noveboracensis*), southern lady fern (*Anthyrium filix-femina*), round-fruited switch grass *(Dicanthelium sphaerocarpon*), naked tick-trefoil (*Desmodium nudiflorum*), *Aster cordifolius* and wavy-leaved aster (*Aster undulatus*) codominate.

Often Montane Oak-hickory slope Forest Community grades into boarding communities such as a Rich Cove Forest Community lower in the cove and grades into Chestnut-Scarlet Oak Forest higher on the slope.

The Montane Oak-hickory slope Forest community is found throughout the analysis area. This community grades into or has small inclusions of Rich Cove and Slope Forest and areas classified as Montane Oak-Hickory Slope Forest can contain elements of a “Rich Cove” community. These “Rich Cove” elements are wide spread throughout the analysis area. Harvest units with the Montane Oak-hickory slope Forest Communities are expected be in an early

succession after harvest. This community has a moderate potential for T.&E., S. and FC. species.

Possible activity areas with Montane Oak-hickory slope Communities: Unit 2, 3 & 5.

Possible associated T.&E., S. and FC. species in Yancey Co.: *Carex woodii* (FC.), *Silene ovata* (S.).

Rich Cove and Slope Forest.
Synonymy: Rich Cove Forest (Schafale & Weakley).

Dominate Species & Physiognomy: The Rich Cove and Slope Forest community occurs typically in coves and lower slopes. Soil nutrients and/or soil pH is thought to influence the relative high fertility and plant diversity of this community (Newell). More mesic conditions exist in this community than the surrounding, often xeric, upper slopes. A wide variety of plant species usually exist in this community. The distinctive and diverse mixture of tree species often include: basswood (*Tilia americana*), red oak (*Quercus rubra)*, buckeye (*Aesculus flava*), American ash (*Fraxinus americana*), fire cherry (*Prunus serotina*), tulip popular (*Liriodendron tulipifera*), and black birch (*Betula lenta*). A feature of this community is the practical absence of Ericaous shrubs such as *(Rhododendron maximum*) in the midlayer. The open under story of Rich Cove Community includes: dogwood (*Cornus florida*), stripped maple (*Acer pensylvanicum*), and *Magnolia* species. The herbaceous layer is lush and usually rich in species diversity. Typically, Rich Cove and Slope Forest have greater than 4 herb species per square meter. Only the Rich Oak-Hickory Slope Forest Community can be as herbaceously diverse, although not as "lush", as a Mixed Deciduous Rich Cove and Slope Forest.

The Rich Cove and Slope community is found in limited areas within the analysis area are usually within the lower cove areas. Although this community does not occupy a large percentage of the analysis area, this community grades into Montane Oak-Hickory Slope Forest and areas classified as Montane Oak-Hickory Slope Forest can contain elements of a "Rich Cove" community. These "Rich Cove" elements are wide spread throughout the analysis area. Harvest units with the Rich Cove and Slope Forest are expected be in an early succession after harvest. The net effect of this proposal upon the Rich Cove and Slope community will increase the number of Rich Cove and Slope early succession acres. The Rich Cove and Slope community has the highest potential for T.&E., S. and FC. species in the analysis area.

Note: Within unit 5, the Rich Cove and Montane Oak-Hickory Communities may grade into elements of a Boulderfield Forest Community on the north slope. However, this area lacks the several the characteristic *Ribes* and moss species of a Boulderfield Forest. Because of the different ecology of the Rich Cove and Montane Oak-Hickory Communities, these rocky areas can be referred to has a "Boulderfield forest" meaning that they are rocky-boulder forested areas that contain a Rich Cove or a Montane Oak-Hickory Community. A truly developed Boulderfield Forest, in this area, would have nearly the same the list of possible T.&E., S. and FC. species as the Rich Cove Forest. So, for this analysis, the "Boulderfield forest and Rich

Cove Communities are equivalent. The proposed burn in unit 5 is almost all in the Montane Oak-Hickory Forest or "Boulderfield phase" of Montane Oak-Hickory Forest. Fire may be appropriate in the Montane Oak-Hickory Forest community type.

Possible activity areas with Rich Cove Forest and Slope Communities: Unit 2 & 5.

Possible associated T.&E., S. and FC. species in Yancey Co.: *Aconitum reclinatum* (FC.), *Coreopsis latifolia* (S.), *Botrychium oneidense* (FC.), *Carex woodii (*FC)*., Carex roanensis* (S.)*,Juglans cinerea (S.), Hydrophyllum macrophyllum* (FC.)*, Lonicera canadensis* (FC.)*, Meehania coradata* (FC.)*, Scutellaria saxitais* (FC.*)* and *Silene ovata* (S.).

IV. EFFECTS to BOTANICAL RESOURCES.

A. GENERAL EFFECTS

The general potential effects to T.&E., S. and FC. plant species that are exposed to logging and construction activities such as moving heavy equipment, skidding logs, and road construction are direct impacts of damaging individual plants and the indirect effects of modifying the habitat. Some of the expected indirect effects of timber removal will initially produce an increase in light, temperature, reduce humidity, and decrease soil surface moisture. These effects may have a positive affect or negative affect depending upon the particular plant species. Some weedy and early successional species such as *Rubus*, are expected to increase in the activity area. T.&E., S. and FC. plant species may be negatively effected by the competition of these species. The long term effect of rotational logging practices upon the general plant communities are poorly understood. There is some evidence that the repopulation of some herbaceous plant species in mixed mesophyitic communities may take more than a hundred years after logging. Most species are expected to recover faster than that. Clear cutting in relatively large patches is thought to have a greater effect than that of Shelterwood type of treatments or two-aged treatments. See the Forest Plan, Standards and Guides for a description of these methods.

B. PLANT SENSITIVE & FOREST CONCERN SPECIES.

There are no known T.&E., or FC. plants species within the proposed activity areas will directly or indirectly effect. Some alternatives of this proposal may effect the Sensitive species *Juglans cinerea*. This species is discussed below. There are no other S. species that this proposed activity will indirectly effect other than *Juglans cinerea*. All the known populations of T.&E., FC. and other S. species with the project area (*Aconitum reclinatum* (S.),and *Carex woodii* (FC.) *Carex projecta* habitat) are to far from the proposed activity to have any effect on these know populations or habitat of these populations. Although *Juglans cinerea* is known to occur, no other plant T.&E., S. and FC. species or are known (or expected) to occur in the activity areas. It does not imply that they absolutely do not occur in the proposed activity or analysis areas. In very broad definitions of habitat, the species listed on Table 2 could potentially occur in activity or project areas. There is a small risk that populations these species have escaped detection and could be affected by the proposal. However, because of negative survey results, it is unlikely that

other plant T.&E., S. and FC. or species occur in the activity areas. Because there are no known populations of other Forest Concern or Sensitive plant species in or near the proposed activity areas, there are no known effects (direct, indirect or cumulative) to these possible species.

Juglans cinerea
Status: Federal C2; State, Watch List; Global, G3; Forest, Sensitive.
Juglans cinerea is a tree that is found from western New Brunswick to North Dakota south to Georgia in rich forest communities. It is rapidly declining because of a fungal disease and is the primary cause for the species viability. Individual element occurrences of *Juglans cinerea* populations within North Carolina are not actively tracked on the BCD data base system. However, there are greater than 100 known populations of this species in North Carolina (J. Amarosa). These populations are mostly in the mountain counties of North Carolina. A small population of a few individuals of *Juglans cinerea* are known from unit 3.

Possible direct and indirect effects:
The known local population will be avoided direct impacts in alternatives 3 and 4 but may be directly affected in alternative 2. Removal or partial removal of the over story, tree canopy or competing vegetation (such as grape vine), is known to benefit this species. The indirect effects of alternatives 3 and 4 should have a positive, beneficial effect to the local populations. Alternative 1 will not directly affect *Juglans cinerea*, however; the competing effect of the existing vegetation may, over time, depress the vigor of the population.

Possible cumulative effects:
There is two recent proposal(s) within the Pisgah National Forests that have been known to effect or may effect *Juglans cinerea*. One proposal to widen Waterville road within Haywood Co. may negatively effect two individual of *Juglans cinerea* and a timber harvest within the Davidson River watershed in Transylvania Co. may positively effect several individuals of *Juglans cinerea*. The sum total of all these effects does not have a significant effect upon Forest population viability.

Summary of effect for *Juglans cinerea*:
Because there are so many known populations of *Juglans cinerea* and the concern for this species is a fungal pathogen and not habitat disturbance, any alternative of this project will not contribute to negative trend for this species. No individuals of *Juglans cinerea* is expected to be affected directly in Alternative 3 and 4. Individuals of *Juglans cinerea* may be directly affected in Alternative 2. Alternative 1 may be negatively indirectly effect the population by not removing competing vegetation . Alternatives 3 and 4 may positively indirectly effect *Juglans cinerea*. by removing competing vegetation.

Watch List Species
Three North Carolina Watch list species occur within the proposed activity areas. *Diplazium pycnocarpon* and *Goodyera repens* in unit 2. *Diplazium pycnocarpon* and *Goodyera repens* are rare within North Carolina but relatively secure (W1 category). *Juglans cinerea* is an NC. watch list species and Forest Sensitive species (see above). Element occurrences of these species are not actively tracked.

C. EXOTIC PLANT SPECIES.
Discussion of effects to native and non-native plant species found in the Activity Area:
It is expected that there will be a temporary increase of ruderal (weedy) species of plants. These species are often prevalent during the initial stages of succession. This is particularly true near constructed roads and log landings. A high percentage of these ruderal species are non-native. There are 124 species of non-native plant species as being documented to occur on the Pisgah and Nantahala National Forest (Danley and Kauffman). An increase of non-native plant species in the proposed activity area is expected. Many of these species, both native and non-native, have benefits for wildlife and erosion control. However, has succession progresses, most ruderal species tend to become much less prevalent and generally do not persist in the area. Most ruderal plant species are expected to decrease to nonsignificant population levels within ten years after the initial disturbance.

The **persistence** of most non-native plant species is not considered desirable to natural ecosystem health. There are primarily two ways in which non-native plant species may persist in the forested ecosystems. A non-native plant species may persist by the introduction of an "invasive non-native species" to the ecosystem or by modification the ecosystem in such a way that an invasive species becomes dominant. Out of the 124 species of non-native plants known to occur on the Pisgah Nantahala National Forest, 11 of these are currently recognized as having aggressive invasive qualities that can dominate local communities (Danley and Kauffman). The proliferation of these species can have a devastating and long lasting effect on natural communities and native species. Kudzu, *Pueraria montana*, is a familiar example of this sort of non native persistent species. Consideration was given to this possible effect this proposal may have to invasive non-native species. It is not expected that this proposal will cause non-native invasive plant species to spread. No species of invasive non-native plants was detected in the area. One species of invasive of plant was detected in the analysis area: *Microstegium vinineum.* The invasive plants *Microstegium vinineum* is so well established in the cove forests of the analysis area that control by any currently known method is entirely impractical. It is not known what affect, if any, this proposal will have on the populations of *Microstegium vinineum* within the analysis area.

The other way in which non-native plants may persist in the area is by continual disturbance. For example, a maintained road shoulder or wildlife field often has persistent ruderal and non-native plant species. These areas are often maintained in an early successional state for wildlife or human benefit. Therefore, it is expected that this proposal could slightly increase the persistence non-native vegetation in the analysis area. To mitigate this effect, it is recommended, as a

management recommendation, that native plants be utilized in wildlife improvement and roadside erosion control plantings. It is recognized that erosion control and wildlife production are the primary goals of seeding areas and some non-native plant species may be highly beneficial to accomplish these goals. However, the presidential executive order [Executive order 11987, Title 3- The President] recognizes the need to reduce the impact of non-native species by reducing the amount in which non-native plant species are planted on federal property. All the goals of erosion control, wildlife production and encouragement of native plant species may be met by planting native plant species or a suitable mixture of native and non-native mixture of species.

V. MANAGEMENT RECOMMENDATIONS

It is recommended that native plants be utilized in erosion control and wildlife seeding to reduce the introduction on non-native vegetation in the analysis area.

VI. SUMMARY OF EFFECT

This proposal will not affect any proposed or listed Federal threatened or endangered plant species. This proposal (alternative 2) may negatively impact individuals of *Juglans cinerea*, but will not cause a trend towards federal listing or significantly effect Forest viability of the species. This proposal will have no known effect of any other Regional Forester's Sensitive or Forest Concern plant species. There are no recommendations or mitigation given to lessen the effect of this proposal (all alternatives). Consultation with the US. Fish and Wildlife Service is not required.

Table 3.
Summary of Effect by Alternative.

SPECIES	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
No plant T.&E., S. and FC. species known	No effect known to any T.&E., S. and FC. species. Ecological successional state will be maintained.	May negatively impact population of *Juglans cinerea* . No other effect known to any T.&E., S. and FC. species. Early successional ecological state will be generated.	May indirectly favorably impact population of *Juglans cinerea*. No effect known to any T.&E., S. and FC. species. Early successional ecological state will be generated.	May indirectly favorably impact population of *Juglans cinerea*. No effect known to any T.&E., S. and FC. species. Early successional ecological state will be generated.

David M. Danley, Forest Botanist

Jan. 7, 2000

APPENDIX

A. VASCULAR PLANTS FOUND DURING 1998 SURVEYS: (This not a complete or exhaustive list of all the plant species known within the activity or project area)

Acer pensylvanicum
Acer rubrum
Acer saccharinum
Achillea millefolium
Actaea pachypoda
Adiantum pedatum
Ageratina altissima
Alliaria petiolata
Allium tricoccum
Alnus serrulata
Amelanchier arborea
Amphicarpaea bracteata
Anemone quinquefolia
Antennaria plantaginifolia
Anthoxanthum odoratum
Arabis laevigata
Aralia spinosa
Arctium minus
Arisaema triphyllum
Aristolochia macrophylla
Arnoglossum muhlenbergii
Asarum canadense
Aster chorolepis
Aster cordifolius
Aster divaricatus
Aster pilosus
Aster undulatus
Astilbe biternata
Athyrium filix-femina
Aureolaria laevigata
Betula alleghaniensis
Betula lenta
Botrychium biternatum
Botrychium virginianum
Campanula divaricata
Capsella bursa-pastoris
Cardamine concatenata
Cardamine diphylla
Cardamine hirsuta
Carex aestivalis
Carex blanda
Carex communis
Carex gracillima
Carex laxiflora
Lindera benzoin
Liriodendron tulipifera
Carex muhlenbergii
Carex pensylvanica
Carex scabrata
Carya alba
Carya glabra
Carya ovalis
Caulophyllum thalictroides
Chamaelirium luteum
Chimaphila maculata
Chrysosplenium americanum
Cimicifuga americana
Circaea alpina
Cirsium muticum
Claytonia caroliniana
Clematis virginiana
Clintonia umbellulata
Collinsonia canadensis
Conopholis americana
Convallaria majuscula
Coreopsis major
Cornus florida
Coronilla varia
Corylus americana
Danthonia sericea
Daucus carota
Delphinium tricorne
Dennstaedtia punctilobula
Dicanthelium acuminatum
Dicanthelium boscii
Dicanthelium commutatum
Dicanthelium dichotomum
Dicentra cucullaria
Dioscorea quaternata
Diphylleia cymosa
Disporum lanuginosum
Dryopteris carthusiana
Echinochloa colona
Epigaea repens
Erigeron philadelphicus
Erigeron pulchellus
Eupatorium coelestinum
Eupatorium fistulosum
Eupatorium perfoliatum
Eupatorium purpureum
Lobelia cardinalis
Lobelia siphilitica
Eupatorium rotundifolium
Eupatorium steelei
Fagus grandifolia
Festuca subverticillata
Fragaria virginiana
Fraxinus americana
Galax urceolata
Galearis spectabilis
Galium aparine
Galium circaezans
Galium latifolium
Galium triflorum
Gamochaeta purpurea
Gaylussacia ursina
Gentiana clausa
Geranium carolinianum
Gnaphalium obtusifolium
Goodyera pubescens
Halesia tetraptera
Hamamelis virginiana
Helenium autumnale
Helianthus microcephalus
Hepatica nobilis
Heuchera villosa
Hieracium paniculatum
Holcus lanatus
Houstonia purpurea
Houstonia serpyllifolia
Hydrangea arborescens
Hydrophyllum virginianum
Hypericum punctatum
Hypoxis hirsuta
Ilex montana
Ilex opaca
Impatiens pallida
Iris cristata
Iris verna
Juncus effusus
Juncus tenuis
Kalmia latifolia
Laportea canadensis
Lespedeza cuneata
Leucanthemum vulgare
Lilium superbum
Luzula multiflora
Lycopodium digitatum

Lysimachia quadrifolia
Magnolia fraseri
Maianthemum racemosum
Medeola virginiana
Melampyrum lineare
Microstegium vimineum
Mitchella repens
Mitella diphylla
Monarda clinopodia
Muhlenbergia tenuiflora
Nyssa sylvatica
Obolaria virginica
Osmorhiza claytonii
Osmunda cinnamomea
Oxalis violacea
Oxydendrum arboreum
Parthenocissus quinquefolia
Pedicularis canadensis
Phegopteris hexagonoptera
Phryma leptostachya
Phytolacca americana
Pilea pumila
Pinus rigida
Pinus strobus
Plantago virginica
Pleopeltis polypodioides
Poa annua
Poa autumnalis
Podophyllum peltatum
Polygala paucifolia
Polygonatum biflorum
Polygonum punctatum
Polypodium virginianum
Polystichum acrostichoides
Potentilla canadensis
Prenanthes altissima
Prunella vulgaris
Prunus americana
Prunus serotina
Pteridium aquilinum
Pycnanthemum pycnanthemoides
Pyrularia pubera
Quercus alba
Quercus coccinea
Quercus prinus
Quercus rubra
Ranunculus allegheniensis
Ranunculus hispidus
Rhododendron calendulaceum
Rhododendron maximum
Rhus copallina
Ribes cynosbati
Robinia pseudoacacia
Rubus argutus
Rumex crispus
Salix humilis
Sambucus canadensis
Sanguinaria canadensis
Sanicula canadensis
Sanicula odorata
Sassafras albidum
Saxifraga michauxii
Saxifraga virginiensis
Schizachyrium scoparium
Sedum ternatum
Senecio anonymus
Silene stellata
Smallanthus uvedalius
Smilax herbacea
Smilax rotundifolia
Stellaria corei
Stellaria media
Stellaria pubera
Taraxacum officinale
Teucrium canadense
Thalictrum clavatum
Thalictrum dioicum
Thaspium trifoliatum
Thelypteris noveboracensis
Tiarella cordifolia
Tipularia discolor
Toxicodendron radicans
Tradescantia subaspera
Trifolium pratense
Trillium erectum
Trillium grandiflorum
Tsuga canadensis
Tussilago farfara
Uvularia grandiflora
Vaccinium corymbosum
Vaccinium pallidum
Vaccinium stamineum
Verbena urticifolia
Vernonia noveboracensis
Vicia caroliniana
Viola blanda
Viola hastata
Viola rotundifolia
Viola sagittata
Viola sororia
Vitis rotundifolia
Zizia aurea

B. LIST OF KNOWN T.&E., S. and FC. Plant Species of Yancey Co.

SPECIES	FORM	Natural Communities
Abies fraseri	Vascular plant	Spruce-Fir Forest, Northern Hardwood Forest
Aconitum reclinatum	Vascular plant	Rich Cove Forest, Northern Hardwood Forest, High
Acrobolbus ciliatus	Liverwort	Unknown
Adlumia fungosa	Vascular plant	Rich Cove Forest, Montane Acidic Cliff, Montane
Agrostis mertensii	Vascular plant	Grassey Bald, High Elevation Rocky Summit
Anomylia cunefolia	Liverwort	Spruce-Fir Forest, on bark of fraser fir
Bazzania nudicaulis	Liverwort	Spruce-Fir Forest, High Elevation Rocky Summit
Betula cordifolia	Vascular plant	Spruce-Fir Forest
Botrychium oneidense	Vascular plant	Rich Cove Forest, Spruce-Fir Forest, Southern
Calamagrostis cainii	Vascular plant	High Elevation Rocky Summit
Caltha palustris	Vascular plant	Swamp Forest-Bog Complex, Southern Appalachian
Campanula aparinoides	Vascular plant	Rocky Shore and Bar, Southern Appalachian Bog
Cardamine clematitis	Vascular plant	Spruce-Fir Forest, High Elevation Seep, Montane
Cardamine flagellifera	Vascular plant	Northern Hardwood Forest
Carex buxbaumii	Vascular plant	Southern Appalachian Bog, Southern Appalachian
Carex manhartii	Vascular plant	Rich Cove Forest, Acidic Cove Forest
Carex misera	Vascular plant	Grassey Bald, High Elevation Rocky Summit, High
Carex ruthii	Vascular plant	Unknown
Cephalozia pleniceps var.	Liverwort	Unknown
Cetrelia centrarioides	Lichen	Spruce-Fir Forest
Chelone cuthertii	Vascular plant	Southern Appalachian Bog
Cladium mariscoides	Vascular plant	Southern Appalachian Bog, Southern Appalachian
Coreopsis latifolia	Vascular plant	Rich Cove Forest
Dicentra eximia	Vascular plant	Montane Acidic Cliff, Montane Mafic Cliff
Dicranum undulatum	Moss	Southern Appalachian Bog, High Elevation Seep
Diervilla rivularis	Vascular plant	Acidic Cove Forest
Epilobium angustifolium	Vascular plant	Grassey Bald, Spruce-Fir Forest
Euphorbia purpurea	Vascular plant	Rich Cove Forest, High Elevation Red Oak Forest,
Filipendula rubra	Vascular plant	Swamp Forest-Bog Complex, Southern Appalachian
Gentiana austromontana	Vascular plant	Grassey Bald
Geum radiatum	Vascular plant	Heath Bald, High Elevation Rocky Summit
Gymnoderma lineare	Lichen	High Elevation Rocky Summit, High Elevation
Helianthemum propinquum	Vascular plant	High Elevation Red Oak Forest, High Elevation
Helianthus glaucophyllus	Vascular plant	Rich Cove Forest,
Huperzia appalachiana	Vascular plant	Grassey Bald
Hydrophyllum macrophyllum	Vascular plant	Rich Cove Forest, Basic Oak-Hickory Forest
Hypericum graveolens	Vascular plant	High Elevation Balds,
Hypericum mitchellianum	Vascular plant	High Elevation Balds,
Hypotrachyna sinulosa	Lichen	Spruce-Fir Forest,
Hypotrchyna virginica	Lichen	Spruce-Fir Forest,
Krigia montana	Vascular plant	Granitic Domes, High Elevation Rock Outcrop
Leptodontium flexifolium	Moss	High Elevation Rocky Summit, Acidic Cliff, Montane
Leptohmenium sharpii	Moss	Spruce-Fir Forest

Lilium grayi	Vascular plant	Grassey Bald, Northern Hardwood Forest,
Lilium philadelphicum var.	Vascular plant	Grassey Bald
Lonicera canadensis	Vascular plant	Southern Appalachian Bog,
Meehania cordata	Vascular plant	Rich Cove Forest, Boulderfield Forest, Acidic Cove
Metzgeria fruticulosa	Liverwort	Spruce-fir Forest, Northern Hardwood Forest
Phlox subulata	Vascular plant	Montane Mafic Cliff, High Elevation Mafic Glade
Plagiochila caduciloba	Liverwort	Acidic Cove Forest, Spray Cliff
Plagiochila corniculata	Liverwort	Spruce-Fir Forest
Plagiochila sharpii	Liverwort	High Elevation Rocky Summit
Plagiochila sullivantii var.	Liverwort	Spruce-Fir Forest
Platanthera peramoena	Vascular plant	Southern Appalachian Bog, High Elevation Seep,
Poa palustris	Vascular plant	Spruce-Fir Forest, Grassey Bald
Prenanthes roanensis	Vascular plant	Grassey Bald, High Elevation Rocky Summit,
Rhododendron vaseyi	Vascular plant	Spruce-Fir Forest, Heath Bald, Grassey Bald,
Rubus idaeus ssp. strigosus	Vascular plant	Spruce-Fir Forest
Sanguisorba canadensis	Vascular plant	Southern Appalachian Bog, Southern Appalachian
Saxifraga caroliniana	Vascular plant	Northern Hardwood Forest, Montane Mafic Cliff,
Scutellaria galericulata	Vascular plant	Unknown
Senecio pauperculus	Vascular plant	Basic Oak-Hickory Forest, Diabase Glade,
Senecio schweinitzianus	Vascular plant	Grassey Bald
Silene ovata	Vascular plant	Rich Cove Forest, High Elevation Red Oak Forest
Solidago squarrosa	Vascular plant	Spuce-Fir Forests
Solidago uliginosa	Vascular plant	Montane Mafic Cliff, Southern Appalachian Fen,
Sphagnum squarrosum	Moss	High Elevation Seep, Spray Cliff
Sphenolobopsis pearsonii	Liverwort	Spruce-Fir Forest
Spiraea virginiana	Vascular plant	Rocky Shore and Bar, Piedmont/ Low Mountain
Streptopus amplexifolius	Vascular plant	Spruce-Fir Forest
Thermopsis fraxinifolia	Vascular plant	Pine-Oak Heath
Trillium rugellii	Vascular plant	Rich Cove Forest
Tsuga caroliniana	Vascular plant	Pine-Oak Heath, Chestnut Oak Forest, rock
Veronica americana	Vascular plant	Rocky Shore and Bar
Zigadenus elegans ssp.	Vascular plant	Basic Mesic Forest
Zigadenus leimanthoides	Vascular plant	Heath Bald

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